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SMALL AREA PEAK-FLOW HIGHWAY PROGRAM

Progress Report
to the
Montana State Highway Commission
for the
Water Year Ending September 30, 1959

By

Fred C. Boner

U. S. GEOLOGICAL SURVEY
408 FEDERAL BUILDING
HELENA, MONTANA
MARCH 1960

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CONTENTS

	Page
Introduction.	1
Purpose of the program.	2
Station network	2
Progress during the season.	11
Plans for the 1960 water year	20

ILLUSTRATIONS

Figure 1. Map showing location of crest-stage gages and areas.	10
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TABLES

Table 1-A. List of peak-flow data-collection sites	4
1-B. List of peak-flow data-collection sites financed by Montana State Engineer	9
2-A. Annual peak stages and discharges at crest-stage gage stations	12
2-B. Annual peak stages and discharges at crest- stage gage stations financed by Montana State Engineer. .	18
3. Summary of progress by areas, water year ending Sept. 30, 1959.	19

SMALL AREA PEAK-FLOW HIGHWAY PROGRAM

Progress Report to the Montana State Highway Commission
for the
Water Year Ending September 30, 1959

Introduction

This is the fifth progress report prepared for the Montana State Highway Commission under the provisions of annual cooperative agreements. It summarizes the progress made during the 1959 water year beginning October 1, 1958 and ending September 30, 1959.

Prior to November 1, 1958 the investigations were financed through equal matching of Montana State Highway Commission and U. S. Geological Survey funds. The subsequent cooperative agreement provides for the full reimbursement of appropriate costs by the Commission through its Planning Survey funds. As these latter funds are subject to a more favorable matching ratio by the U. S. Bureau of Public Roads, an expansion of this program was made possible.

The number of crest-stage gage stations for the observation of flood peaks was more than doubled to achieve a state-wide network of data collection sites. A few additional recording gage stations were re-established for more complete observations of peak flows.

Information on outstanding floods and other flow data was furnished on request to Mr. L. W. Hargrove, hydrologist, Montana State Highway Commission.

Purpose of the Program

The primary purpose of the Small Area Highway Program is to provide the necessary information for making a magnitude and frequency study of peak flows.

An analysis of the data collected at the original group of 45 gaging stations in eastern Montana during the first 6 years of operation will be made after the 1961 water year. A state-wide flood-frequency report will be prepared following the 1964 water year, providing sufficient data have been collected to give reliable results. It should be understood that a prolonged period in which low-magnitude peak flows were experienced would require an extension of the program until high-magnitude peak flows could be observed. These studies will utilize the peak flow data collected under this program, as well as the data collected by the regular established cooperative program of the Geological Survey. The report will determine the magnitude and frequency of floods from various sizes of drainage basins which will be useful in the design of adequate highway drainage structures.

A secondary purpose of the program is to provide the Montana State Highway Commission and its employees with current data and the results of interim studies.

Station Network

A number of crest-stage gage stations are being operated to collect only peak-flow data, and a few recording stations, formerly operated under other cooperative agreements, have been reactivated to obtain more complete records for use in this program. Additional data collected through the regular established program of the Geological Survey is also available to supplement the special data-collection program. The original Highway Program network consisted of 47 gaging stations of both types located in 10

areas. From 1956 to 1958, a few stations were discontinued and others established so that by the end of the 1958 water year, 45 gaging stations were in operation, of which 42 were crest-stage gage stations and 3 were recording stations.

As a result of the expanded program, 87 additional crest-stage gage stations were established and 6 additional recording stations reactivated during the 1959 water year. On September 30, 1959, 138 gaging stations were being operated, of which 129 were crest-stage gage stations and 9 were recording stations. A list of the stations is presented in table 1-A. The location of each station and the 32 areas in which they are grouped are shown in figure 1.

Under a separate cooperative agreement with the Montana State Engineer, the Geological Survey is also operating 14 crest-stage gages in eastern Montana. Of the 14 stations, 8 are grouped in 3 areas and the remaining 6 are located at selected isolated sites. These stations are listed in table 1-B and their locations are shown in figure 1. The peak-flow data collected at these stations will be available for use in the magnitude and frequency study.

Weather reports containing information on the amount and duration of rainstorms, as well as snow accumulation and ground conditions during the winter months, were made by six unpaid observers. These reports have been extremely helpful in determining the date on which a peak flow occurred on a stream located in the vicinity of the rain gage.

Table 1-A.--List of peak-flow data-collection sites

Area and station name, in downstream order	Drainage area
Missouri River basin	
Dillon—Area No. 14	
Long Creek near Lakeview	
Red Rock River tributary near Monida	
Traux Creek near Lima.	
Muddy Creek near Dell.	
Sheep Creek below Muddy Creek, near Dell	280
Sage Creek tributary near Dell	
Beaverhead River tributary near Dillon	
Beaverhead River tributary No. 2 near Dillon	
Idaho Creek near Alder	
Butte—Area No. 15	
Moose Creek near Divide.	
Whitehall—Area No. 16	
Fish Creek near Silverstar	
Jefferson River tributary near Whitehall	
Jefferson River tributary No. 2 near Whitehall	
Sand Creek at Sappington	
Jefferson River tributary No. 3 near Sappington.	
Jefferson River tributary No. 4 near Three Forks	
Jefferson River tributary No. 5 near Three Forks	
Bozeman—Area No. 17	
Squaw Creek near Gallatin Gateway.	
Logger Creek near Gallatin Gateway	
East Gallatin River near Bozeman	49.5
Pitcher Creek near Bozeman	
Bear Canyon Creek near Bozeman	17.6
Townsend—Area No. 18	
Castle Creek tributary near Ringling	
Cabin Creek near Townsend.	
Deep Creek near Townsend	
Helena—Area No. 19	
Mitchell Gulch near East Helena.	
Spring Creek near Helena	
Lyons Creek near Wolf Creek.	
Dog Creek near Craig	
Wegner Creek at Craig.	

Table 1-A.—List of peak-flow data-collection sites—Continued

Area and station name, in downstream order	Drainage area
Missouri River basin—Continued	
White Sulphur Springs—Area No. 20	
Five Mile Creek near White Sulphur Springs.	
Newland Creek near White Sulphur Springs.	6.74
Sheep Creek near Neihart.	
Nuggett Creek near Neihart.	
Great Falls—Area No. 1	
Smith River tributary near Eden	
Goodman Coulee near Eden.	
Sun River tributary near Great Falls.	21.1
Choteau—Area No. 21	
Beaver Creek at Gibson Dam, near Augusta.	
North Fork Dry Fork Marias River near Dupuyer	
Lone Man Coulee near Valier	
Lone Man Coulee tributary near Valier	
Loma—Area No. 22	
Dry Fork Coulee tributary near Loma	
Marias River tributary at Loma.	
Marias River tributary No. 2 at Loma.	
Lewistown—Area No. 23	
Judith River tributary near Utica	
Judith River tributary No. 2 near Utica	
Casino Creek tributary near Lewistown	
North Fork McDonald Creek tributary near Heath.	
Alkali Creek near Heath.	
Harlowton—Area No. 2	
Antelope Creek tributary near Harlowton	
Antelope Creek tributary near mouth, near Harlowton . .	2.8
Antelope Creek tributary No. 2 near Harlowton	
Antelope Creek at Harlowton	73
Winnett—Area No. 3	
Box Elder Creek tributary near Winnett.	16.2
McDonald Creek at Winnett	
Box Elder Creek tributary No. 2 near Cat Creek.	2.32
Box Elder Creek tributary No. 3 near Cat Creek.81

Table 1-A.—List of peak-flow data-collection sites—Continued

Area and station name, in downstream order	Drainage area
Missouri River basin—Continued	
Havre—Area No. 24	
Sage Creek tributary at Hingham	
Spring Coulee tributary near Havre.	
Spring Coulee near Havre.	
Big Sandy Creek near Assinniboine	
Bullhook Creek near Havre	
Milk River tributary near Lohman.	
Malta—Area No. 4	
Black Coulee near Malta	
Alkali Creek near Malta	
Disjardin Coulee near Malta	
South Fork Taylor Creek near Malta.	
Wolf Point—Area No. 5	
West Fork Wolf Creek near Lustre.	
East Fork Wolf Creek near Lustre.	
Wolf Creek tributary near Wolf Point.	
Wolf Creek tributary No. 2 near Wolf Point.	
Wolf Creek near Wolf Point.	
Circle—Area No. 6	
East Fork Duck Creek near Brockway.	12.4
Duck Creek near Brockway.	52.5
Redwater Creek at Brockway.	
Tusler Creek near Brockway.	90.2
Tusler Creek tributary near Brockway.	
Redwater Creek tributary near Brockway.29
South Fork Dry Ash Creek near Circle.	5.74
McCune Creek near Circle.	
Plentywood—Area No. 7	
Big Muddy Creek at Plentywood	
Box Elder Creek near Plentywood	9.4
Box Elder Creek at damsite, near Plentywood	19.9
Spring Creek near Plentywood.	7.05
Spring Creek at Highway 16, near Plentywood	16.9
Reed Point—Area No. 25	
Yellowstone River tributary near Greycliff.	
Bridger Creek near Greycliff.	
Work Creek near Reed Point.	
Hump Creek near Reed Point.	
Berry Creek near Columbus	

Table 1-A.--List of peak-flow data-collection sites--Continued

Area and station name, in downstream order	Drainage area
Missouri River basin--Continued	
Billings--Area No. 8	
Wets Creek near Billings.	9.14
West Buckeye Creek near Billings.	2.58
Pryor Creek near Billings	
Busby--Area No. 26	
Rosebud Creek near Kirby.	
Rosebud Creek tributary near Busby.	
Muddy Creek tributary near Lame Deer.	
Rosebud Creek near Forsyth.	
Leaf Rock Creek near Kirby.	
Broadus--Area No. 9	
Basin Creek tributary near Volborg.70
Basin Creek near Volborg.	9.50
Sand Creek near Broadus	9.6
North Creek near Alzada68
Wolf Creek near Hammond	9.09
Wibaux--Area No. 10	
Krug Creek tributary near Wibaux.	
Griffith Creek near Glendive.	
Spring Creek near Wibaux.	
Columbia River basin	
Eureka--Area No. 51	
Fortine Creek near Trego.	112
Deep Creek near Fortine	
Kootenai River tributary near Rexford	
Gold Creek near Rexford	
Spring Creek near Stryker	
Libby--Area No. 52	
Severn Gulch near Jennings.	
Tub Gulch near Libby.	
Shaughnessy Creek near Libby.	
Granite Creek near Libby.	23.6
Butte--Area No. 15	
Smith Gulch near Silverbow.	
Drummond--Area No. 53	
Clark Fork tributary near Drummond.	
Morris Creek near Drummond.	
Edwards Gulch at Drummond	

Table 1-A.—List of peak-flow data-collection sites—Continued

Area and station name, in downstream order	Drainage area
Columbia River basin—Continued	
Missoula—Area No. 54	
West Twin Creek near Bonner	
Marshall Creek near Missoula.	
Hayes Creek near Missoula	
Nigger Gulch near Alberton.	
Hamilton—Area No. 55	
Burke Gulch near Darby.	
Camas Creek near Hamilton	
Gash Creek near Victor.	
St. Regis—Area No. 56	
Flat Creek near Superior.	
St. Regis River tributary near St. Regis.	
North Fork Little Joe Creek near St. Regis.	
West Glacier—Area No. 57	
Skyland Creek near Essex.	8.09
Moccasin Creek near West Glacier.	
Middle Fork Flathead River tributary near West Glacier.	
Polson—Area No. 58	
Teepee Creek near Polson.	
Hell Roaring (Big) Creek near Polson.	6.41
Dayton Creek near Proctor	
Hot Springs—Area No. 59	
Mill Creek near Niarada	
Sullivan Creek tributary near Niarada	
South Fork Garden Creek near Hot Springs.	

Table 1-B.--List of peak-flow data-collection sites financed by Montana State Engineer

Area and station name	Drainage area
Jordan--Area No. 11	
Second Creek tributary near Jordan.	0.75
Second Creek tributary No. 2 near Jordan.	
Second Creek tributary No. 3 near Jordan.	
Glasgow--Area No. 12	
Lime Creek tributary near Vandalia.	
Milk River tributary No. 2 near Glasgow	
Intake--Area No. 13	
Linden Creek at Intake.	
Indian Creek at Intake.	
War Dance Creek near Intake	
Miscellaneous	
Currant Creek near Roundup.	
Cat Creek near Cat Creek.	
Little Dry Creek near Van Norman.	
Little Porcupine Creek near Forsyth	
Spring Creek near Decker.	
Willow Creek near Alzada.	

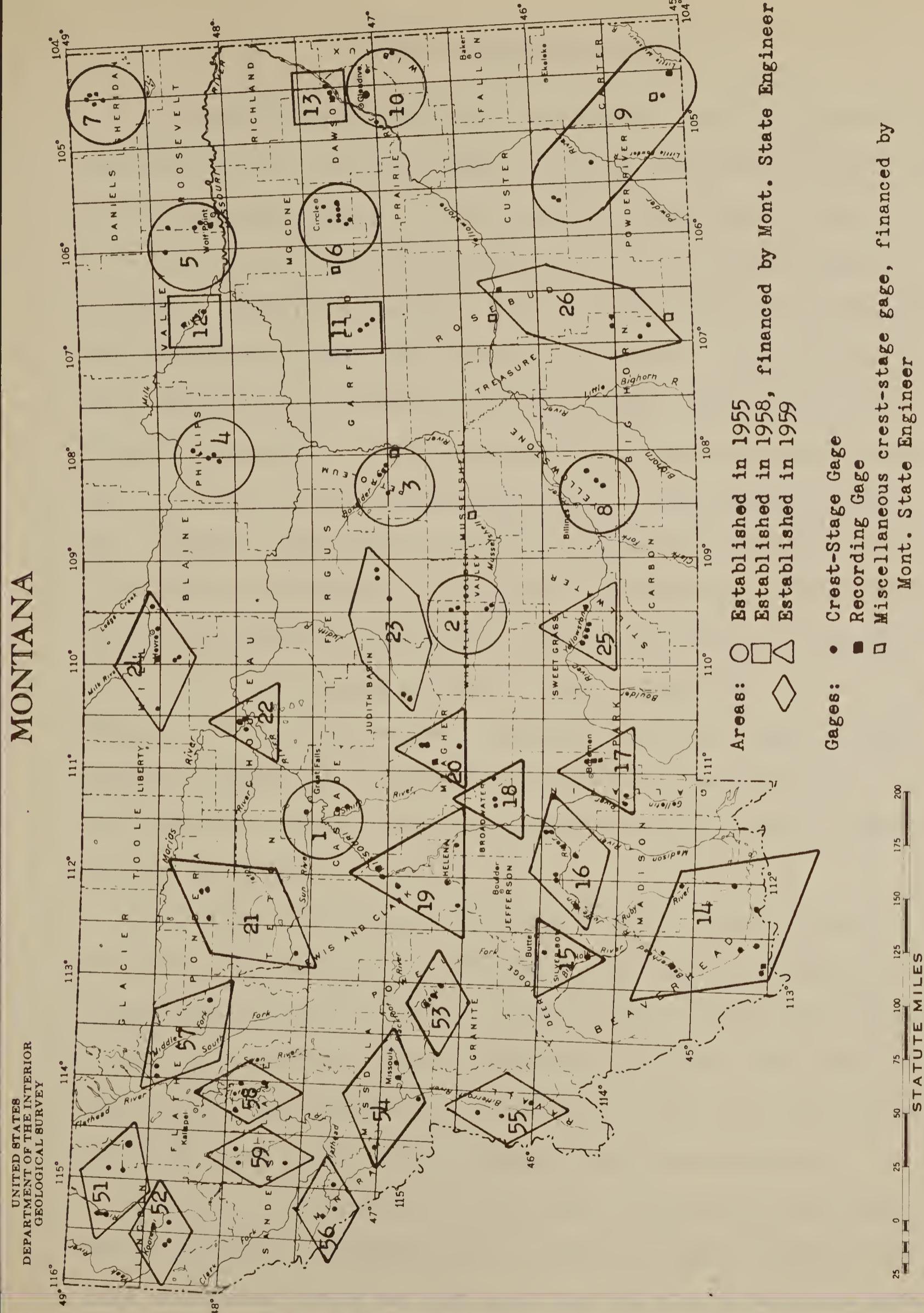


Figure 1.--Map showing location of Crest-Stage Gages and Areas

Progress During the Season

The installation of new gaging stations, as a result of expansion of the program, was an important phase of the work done during the water year. Installation was completed in July, about two months ahead of schedule.

Collection of peak-flow data continued to be the primary phase of operation. During the year 707 visits were made to the gaging stations, and 292 high-water marks were observed and recorded. Determinations of flow consisted of 54 estimates, 107 current-meter measurements, and 13 indirect measurements. These determinations of flow were used in developing 4 new rating curves, bringing the number of rated gaging stations to 42. Although a large number of high-water marks were observed, many were of relatively low magnitude and discharge measurements by indirect methods of these peaks were not warranted. A tabulation of the annual maximum discharge at the rated gaging stations is shown on table 2-A. Table 2-B is a tabulation of the annual maximum discharge at the rated gaging stations which are financed by the Montana State Engineer. A summary of the visits made, high-water marks observed, and number of stations rated is tabulated by areas in table 3.

It is important that all flood peaks at each site are referred to the same datum. When stations are established, the gage is referenced to several semi-permanent marks by levels so that all flood peaks can be adjusted to the same datum if the gage is disturbed or destroyed. The datum selected is an arbitrary elevation and is usually not tied to sea level datum. All of the gages are checked by levels at least once each year.

During the period covered by this report, check levels were run to each of the gages established prior to October 1, 1958, and each of the stations constructed during the 1959 water year was tied to reference marks by levels.

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations

Water year	Date	Gage height (feet)	Discharge (cfs)	Water Year	Date	Gage height (feet)	Discharge (cfs)
Beaverhead River tributary No. 2 near Dillon							
1958	June 24	5.04	170	1959	--	--	(a)
East Gallatin River near Bozeman							
1959	Apr. 1	3.9	337				
Goodman Coulee near Eden							
1959	Apr. 22	1.57	49				
Sun River tributary near Great Falls							
1956	Mar. 20	1.20	1	1958	July 3	2.74	156
1957	June 16	b1.05	.1	1959	Mar. 2	2.52	116
Dry Fork Coulee tributary near Loma							
1959	Mar. 1	4.02	71				
Antelope Creek tributary near mouth, near Harlowton							
1956	Mar. 17	1.60	207	1958	May 23	b.17	17
1957	June 16	1.51	188	1959	Mar. 20	.75	65
Antelope Creek at Harlowton							
1950	June 17	16.73	24,400	1957	June 21	1.52	170
1954	Aug. 15	4.52	1,600	1958	--	--	c < 30
1955	June 26	3.01	591	1959	--	--	c < 30
1956	June 15	b3.28	b 800				
Box Elder Creek tributary near Winnett							
1955	Aug. 23	2.20	132	1958	July 31	2.86	193
1956	June 18	2.11	123	1959	Mar. 1	3.86	412
1957	Feb. 28	.66	27				
McDonald Creek at Winnett (Records for water years 1930-32, 1934-45, 1953-56 published in annual series of Water Supply Papers)							
1957	Mar. 19	b2.20	67	1959	Mar. 1	d6.84	(e)
1958	July 19	b3.23	150				

See footnotes at end of table, page 17.

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations--Continued

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage Height (feet)	Discharge (cfs)
Box Elder Creek tributary No. 2, near Cat Creek							
1955	Aug. 23	5.59	385	1958	July 19	b2.09	83
1956	June 18	2.73	126	1959	June 26	1.84	68
1957	Aug. 30	b1.37	43				
Box Elder Creek tributary No. 3 near Cat Creek							
1955	Aug. 23	3.02	159	1958	July 31	b2.52	122
1956	June 18	.96	32	1959	Sept. 22	.28	10
1957	Aug. 30	1.24	44				
Spring Coulee near Havre							
1959	Mar. 11	5.60	257				
Big Sandy Creek near Assinniboine (Records for water years 1946-53 published in annual series of Water Supply Papers)							
1955	Apr. 11	6.48	698	1958	Mar. 28	--	g 500
1956	Mar. 30	f 6.47	g 550	1959	Mar. 11	7.80	1,100
1957	Feb. 28	f 5.13	g 250				
Alkali Creek near Malta							
1956	Mar. 19	f .85	g 45	1958	Mar. 25	.82	104
1957	Mar. 21	1.69	355	1959	Mar. 13	f 3.0	g 800
Disjardin Coulee near Malta							
1956	Aug. 5	3.22	160	1958	--	--	(a)
1957	Mar. 19	1.02	22	1959	Mar. 18	1.62	132
South Fork Taylor Creek near Malta							
1956	Mar. 19	1.75	52	1958	--	--	(a)
1957	Mar. 19	1.43	22	1959	July 13	1.94	84
East Fork Duck Creek near Brockway							
1955	July 12	1.46	106	1958	July 21	b .19	8
1956	Mar. 2	1.08	60	1959	Mar. 18	2.47	273
1957	July 14	3.64	b 505				

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations--Continued

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
Duck Creek near Brockway							
1957	July 14	4.00	640	1959	Mar. 18	5.15	1,000
1958	July 3	1.05	b 40				
Redwater Creek at Brockway							
1957	July 14	5.8	1,220	1959	Mar. 18	5.53	1,130
1958	July 3	1.86	130				
Tusler Creek near Brockway							
1957	Feb. 27	1.66	200	1959	Mar. 18	f2.16	g 150
1958	July 21	b-.22	14				
Redwater Creek tributary near Brockway							
1954	Aug. 18	7.40	72	1958	--	--	(a)
1957	July 14	9.40	83	1959	Mar. 18	f4.35	g 20
South Fork Dry Ash Creek near Circle							
1955	July 12	2.18	56	1958	June 3	b .23	3
1956	Mar. 1	1.37	17	1959	Mar. 22	2.12	79
1957	Feb. 26	1.58	52				
McCune Creek near Circle							
1955	July 12	4.32	128	1958	June 3	.98	6
1956	Mar. 20	3.31	52	1959	Mar. 22	--	(e)
1957	July 14	b4.93	175				
Big Muddy Creek at Plentywood (Records for water years 1948-53 published in annual series of Water Supply Papers)							
1955	--	--	c < 210	1958	Mar. 29	b12.92	1,630
1956	Mar. 22	f6.63	g 300	1959	June 30	10.61	945
1957	July 16	b6.58	413				
Box Elder Creek near Plentywood							
1956	--	--	(a)	1958	Mar. 30	1.88	22
1957	July 23	7.24	328	1959	June 26	3.89	126

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations--Continued

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
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26 Box Elder Creek at damsite, near Plentywood

1953	June 30	6.52	6,530	1957	July 23	b3.56	1,600
1955	Mar. 29	2.42	890	1958	Mar. 30	b .75	210
1956	--	--	(a)	1959	June 26	1.38	430

27 Spring Creek near Plentywood

1955	July 7	.69	5	1958	Mar. 30	b1.53	25
1956	--	--	(a)	1959	June 26	1.30	20
1957	July 23	2.77	76				

28 Spring Creek at Highway 16, near Plentywood

1955	--	--	(a)	1958	Mar. 30	b2.40	230
1956	Apr. 3	b .74	4	1959	June 26	3.70	660
1957	July 23	3.38	540				

29 Berry Creek near Columbus

1958	July 7	4.54	620	1959	Mar. 1	3.86	283
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30 Wets Creek near Billings

1955	Aug. 25	--	g 5	1958	July 2	.50	14
1956	Feb. 22	3.23	65	1959	June 4	1.14	39
1957	June 8	1.66	62				

31 West Buckeye Creek near Billings

1955	Aug. 25	1.54	17	1958	July 2	1.31	83
1956	May 29	2.24	92	1959	June 4	.68	15
1957	May 12	1.81	185				

32 Pryor Creek near Billings

(Records for water years 1938-53 published in annual series of Water Supply Papers)

1955	June 16	b 3.44	286	1958	Feb. 20	b3.26	262
1956	Feb. 22	b,d9.12	g 800	1959	Mar. 2	4.65	508
1957	June 8	b 6.14	825				

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations--Continued

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
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33 Rosebud Creek tributary near Busby

1959	Mar. --	--	< 5				
------	---------	----	-----	--	--	--	--

34 Muddy Creek tributary near Lame Deer

1959	Mar. --	--	g 5				
------	---------	----	-----	--	--	--	--

35 Rosebud Creek near Forsyth

(Records for water years 1947-53 published in annual series of Water Supply Papers)

1955	--	--	g < 50	1958	Mar. --	--	(e)
1956	Mar. --	8.78	g 350	1959	Mar. 3	--	
1957	June 17	8.78	342				g 570

36 Leaf Rock Creek near Kirby

1958	June 7	--	222	1959	--	--	(e)
------	--------	----	-----	------	----	----	-----

37 Basin Creek tributary near Volborg

1955	July 29	.24	20	1958	July 2	6.96	390
1956	--	--	(a)	1959	Mar. --	--	g 2
1957	--	--	(a)				

38 Basin Creek near Volborg

1955	July 29	1.1	20	1958	July 2	5.79	b 965
1956	Aug. 27	5.76	b 953	1959	Mar. 11	1.87	75
1957	Apr. 24	3.45	300				

39 Sand Creek near Broadus

1955	--	--	(a)	1958	June 7	3.94	93
1956	Mar. 16	1.75	19	1959	Mar. 18	4.79	236
1957	Aug. 28	1.55	15				

40 Griffith Creek near Glendive

1955	July 28	1.80	g 100	1958	July 3	.55	101
1956	Mar. 19	.86	g 80	1959	Mar. 17	.74	157
1957	Mar. 20	.27	50				

Table 2-A.--Annual peak stages and discharges at crest-stage gage stations--Continued

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
North Creek near Alzada							
1955	--	--	(a)	1958	June 3	4.66	417
1956	July 2	4.32	276	1959	June 30	3.21	58
1957	Aug. 28	4.32	276				
Wolf Creek near Hammond							
1955	July 11	4.08	298	1958	June 3	5.76	550
1956	Mar. 22	3.45	b 175	1959	Mar. 19	3.32	154
1957	Aug. 29	4.58	365				
Smith Gulch near Silverbow							
1959	--	--	g 5				
Clark Fork tributary near Drummond							
1958	June 9	1.64	133	1959	--	--	(a)
Burke Gulch near Darby							
1958	May 12	.94	11	1959	May 16	--	g 5
Camas Creek near Hamilton							
1958	May 20	2.52	240	1959	June 7	2.30	190
Gash Creek near Victor							
1958	May 21	--	g 200	1959	June 5	1.58	160
Skyland Creek near Essex							
1959	June 5	2.1	189				

a No evidence of any flow during year

b Revised, supersedes figure published in WSP 1559

c Peak discharge did not reach bottom of gage

d Backwater from beaver dam

e Discharge unknown

f Backwater from ice

g Estimate

Note.--Line in water year column means a gap in the record.

Table 2-B.--Annual peak stages and discharges at crest-stage gage stations
financed by Montana State Engineer

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
Currant Creek near Roundup							
1958	July 19	2.12	a 40	1959	Mar. 1	6.65	780
Cat Creek near Cat Creek							
1958	Aug. 15	2.76	92	1959	Mar. 12	4.58	170
Little Dry Creek near Van Norman							
1958	July 6	.83	160	1959	Mar. 18	6.80	5,200
Little Porcupine Creek near Forsyth							
1958	June 3	4.9	1,480	1959	Mar. 20	7.08	2,650
Spring Creek near Decker							
1958	June 7	3.4	184	1959	Mar. 17	1.19	45.3
Willow Creek near Alzada							
1958	June 4	7.54	455	1959	Mar. 19	7.31	548

a May have been higher in May or June

Table 3.--Summary of progress by areas, water year ending Sept. 30, 1959

Area	Number of stations	Number of stations rated		High-water marks		Number of visits
		Prior to 1959	During 1959	Rated stations	Non- rated stations	
14 Dillon	9	1	0	0	15	37
15 Butte.	2	0	0	0	3	8
16 Whitehall.	7	0	0	0	2	32
17 Bozeman.	5	2	0	2	10	25
18 Townsend	3	0	0	0	6	11
19 Helena	5	0	0	0	8	22
20 White Sulphur Springs	4	0	0	0	3	17
1 Great Falls.	3	1	0	1	3	15
21 Choteau.	4	0	0	0	9	20
22 Loma	3	0	0	0	9	18
23 Lewistown.	5	0	0	0	7	17
2 Harlowton.	4	2	0	1	4	28
3 Winnett.	4	4	0	8	0	25
24 Havre.	6	1	0	2	2	35
4 Malta.	4	1	2	19	10	58
5 Wolf Point	5	1	0	5	10	32
6 Circle	8	6	1	25	4	66
7 Plentywood	5	5	0	21	0	30
25 Reed Point	5	0	0	0	7	24
8 Billings	3	3	0	8	0	15
26 Busby.	5	1	0	6	3	24
9 Broadus.	5	4	0	21	0	42
10 Wibaux	3	0	1	3	7	28
51 Eureka	5	1	0	2	6	15
52 Libby.	4	1	0	3	3	12
53 Drummond	3	0	0	0	3	9
54 Missoula	4	0	0	0	8	12
55 Hamilton	3	3	0	3	0	0
56 St. Regis.	3	0	0	0	6	7
57 West Glacier	3	1	0	1	3	11
58 Polson	3	0	0	0	4	6
59 Hot Springs.	3	0	0	0	6	6
Totals	138	38	4	131	161	707

Plans for the 1960 water year

Peak-flow data collection at all of the 138 gaging stations being operated will continue to be the principal activity during the year.

In addition, information on peak flows resulting from thunderstorms will be collected at points other than gaging stations. These miscellaneous discharge measurements will be made at points where significant damage is reported or the peak discharge may be hydrologically significant. The resources of the Geological Survey do not permit coverage of all reported events, and it is acknowledged that some may escape attention.

Determination of the drainage area size for each gaged site is planned during the year. Completion of this phase of the program during the year will depend upon the availability of proper maps or aerial photographs on which the drainage areas can be delineated.

Data collected during the year will be used in conjunction with that obtained previously to continue the study and the Geological Survey will provide the Commission with as much interim information as possible on the magnitude and frequency of peak flows.

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